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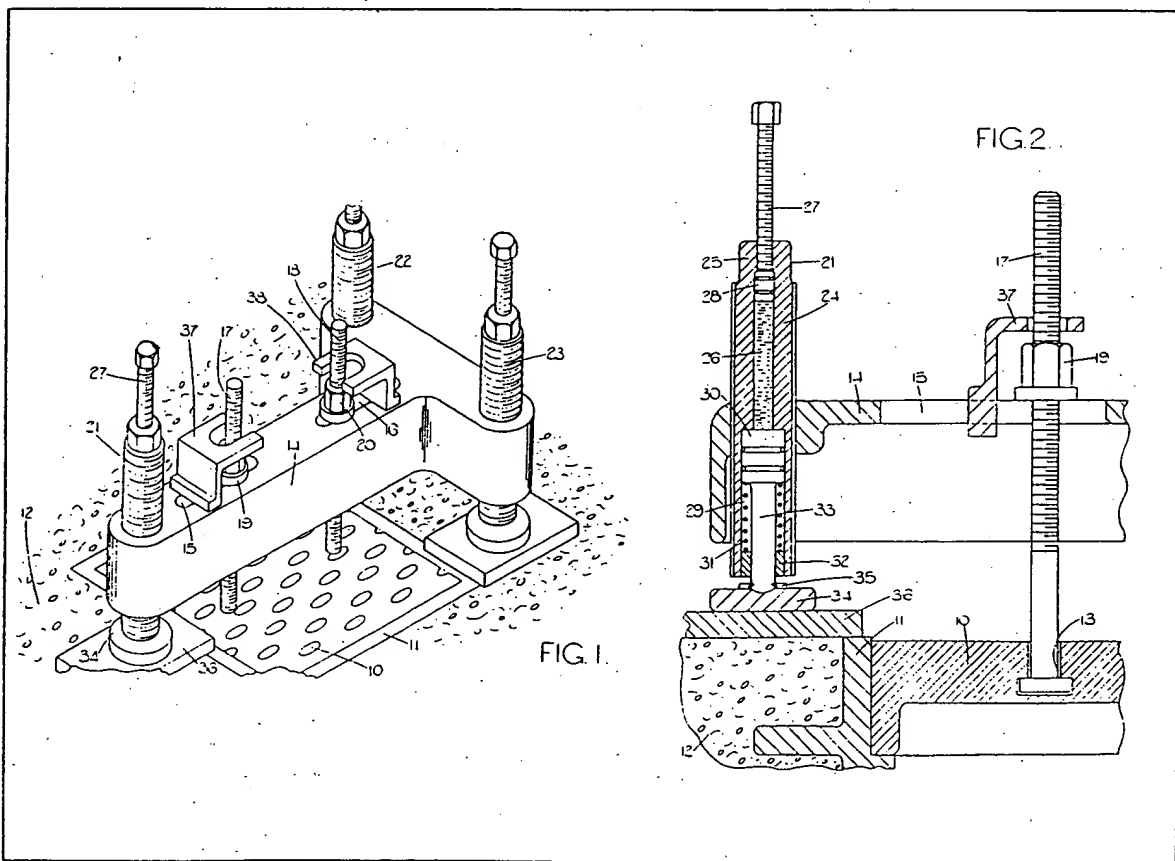
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## (54) Manhole cover lifting device

(57) A manhole cover lifting device comprises a beam 14 carrying one or more tools 17, 18 for engagement in appropriate holes in the manhole cover 10 to be lifted, the beam 14 having jacking devices 21, 22, 23 for exerting forces to the beam, against the ground or a frame 11 for the cover, to lift the beam 14 and therefore through the tools, the manhole cover 10.

Each device 21 may comprise a screw-operated position 28 which compresses oil 26 filling tube 24, thus causing a lower piston 30 to move down against spring 29. The tube 24 is threaded into beam 14 for initial positioning. Brackets 37, 38 protect against breakage of tools 17, 18.



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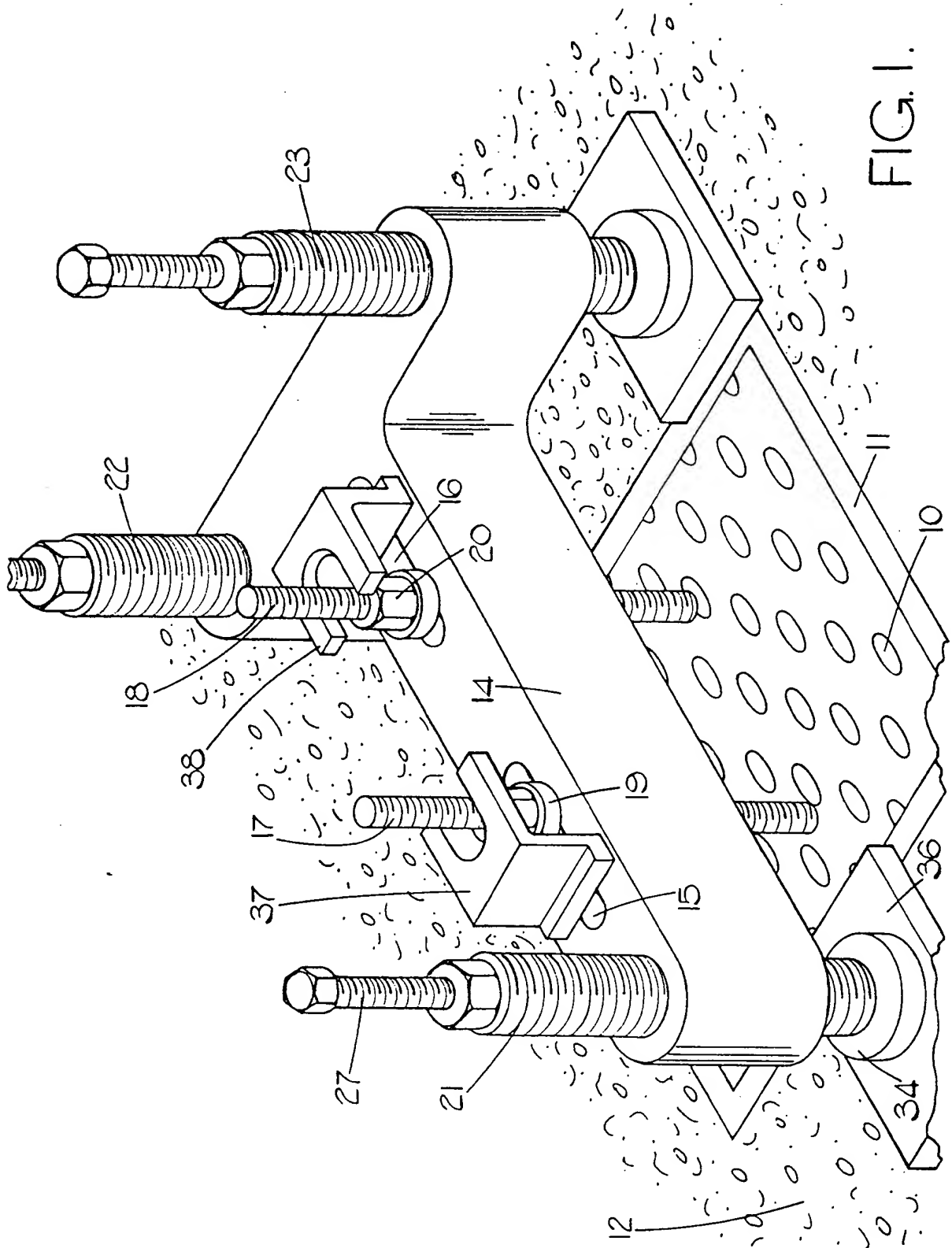
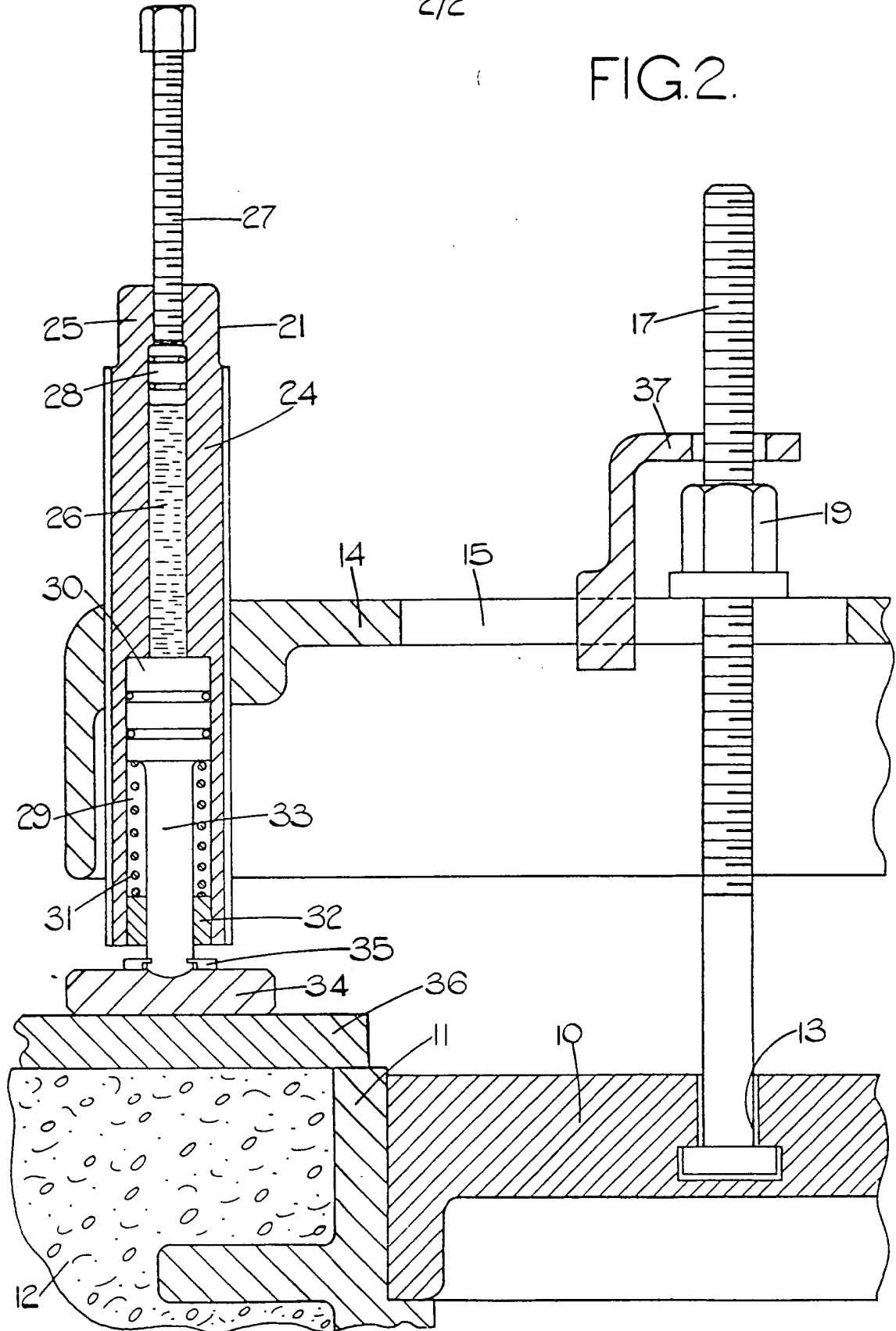


FIG. 1.

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FIG. 2.



## SPECIFICATION

## Manhole cover lifting device

5 This invention relates to devices for lifting manhole covers.

Manhole covers are often left undisturbed for long periods and when they are to be lifted, it is often  
10 extremely difficult to break the seal between the cover and the surrounding frame or other part into which the cover is fitted. This difficulty may be due to dirt or distortion and manual tools such as crowbars are sometimes required but even these  
15 may be ineffective.

Manhole covers are usually provided with holes to accept lifting tools and these may be in a variety of sizes and shapes and their positions and numbers vary considerably.

20 There have therefore been designed various devices which have mechanical means for lifting a cover. Many such devices are complicated to use in that they have complex manhole cover engaging arrangements and also jacking apparatus for carrying out the lifting operation.

25 The object of this invention is to provide a manhole cover lifting device which is simple to use and which is capable of applying sufficient force even to remove the most stubborn of manhole  
30 covers.

According to the invention there is provided a manhole cover lifting device comprising a beam, at least one tool adjustably attached to the beam and arranged to engage in a hole in a manhole cover to be lifted, and at least two jacking devices engaged  
35 directly with the beam, means associated with each jacking device for engaging a frame into which the cover to be lifted is fitted, or the ground around the cover, the jacking devices in use being used to apply  
40 a force tending to lift the beam, and therefore, through the tool, the cover, relatively to the frame or ground.

The invention will now be described by way of example with reference to the accompanying drawings in which;  
45

*Figure 1* is a perspective view of a device constructed in accordance with the invention and shown in a position of use and;

50 *Figure 2* is a part cross-sectional view of the device.

The device illustrated is intended for lifting manhole covers. Manhole covers may be square round or other shaped and are usually mounted in a frame which is embedded in the ground. As shown particularly in *Figure 2* a manhole cover 10 is mounted in a frame 11 which is embedded in tarmac or other surfacing material indicated generally at 12. A number of different manhole and frame constructions are in use but in most cases the frame 11 includes a portion which extends at least as high as the top of the cover itself and is therefore usually substantially level with the surrounding ground surface. The manhole cover 10 and frame 11 are  
65 often shaped to provide a water seal and the cover in

many cases is provided with anti friction ribbing or other surface projections and is cut out on its underneath surface as generally indicated in *Figure 2*. It is however, to be understood that the device  
70 forming the subject of this invention may be used to lift manhole covers of many different sizes and shapes.

Manhole covers are normally provided with holes or sockets to accept manually operable tools. A  
75 typical socket is shown in *Figure 2* at 13. This comprises a circular opening having two diametrically opposite extensions into which can be fitted a tool having a circular section shank with two oppositely directed lugs near its end. At the base of the  
80 socket 13 in the manhole cover 10 there is an enlarged zone into which the lugs on the tools can be located. The method of insertion of the tool is to pass it through the hole with the lugs on the tool aligned with the extensions of the hole and when the tool  
85 end reaches the bottom of the socket the tool is rotated through 90° so that the lugs are no longer in alignment with the extensions in the hole but instead are located under shoulders formed in the socket. A similar arrangement can be used where a through  
90 hole is provided in the manhole cover.

It is however, to be understood that many other forms of socket or hole can be provided in manhole covers and correspondingly shaped manual tools are usually designed to fit with them.

95 Such a manual tool is usually provided with a shank of the appropriate type as described and a ring handle at its other end.

It often happens that a manhole cover will be tight in its frame and cannot be removed merely with the use of the manual tools provided. Where a manhole  
100 cover has not been lifted for a period of years it may have become jammed through dirt in the seal between the cover and the frame and it may also be distorted for example as a result of traffic passing over it and sometimes it is also rusted into position.

105 The device of this invention is intended to assist particularly in the lifting of stubborn manhole covers which have become jammed but it is also useful for lifting heavy covers.

110 The device comprises a beam 14 which in this example is generally T-shaped and is made as a casting with a generally flat top and a hollow underneath.

In the upright portion of the T there are formed  
115 two elongated spaced slots 15, 16 to accept adjustable tools 17, and 18. Each such tool is adapted for engagement with the particular type of cover to be lifted and is shown in *Figure 2* the tool 17 has a head of the kind described before and including a circular  
120 shank with lugs extending in two opposite directions. In this example the lugs may be formed as a cross-bar of flat section secured to the end of the circular shank. The circular shank is moreover screw threaded over the greater part of its length and  
125 passes through the slot 15 in the beam 14. On the top of the beam is engaged a nut 19 whereby the tool 17 can be adjusted to engage in the manhole cover socket 13. A similar arrangement is used for the tool 18 engaging with a nut 20. The slots 15, 16 enable  
130 the tools to be moved relatively to one another so as

to engage in holes in the manhole cover 10 as appropriate.

In the end of the upright of the T of the beam and also at the extremities of the head of the T of the beam there are respective jacking devices 21, 22, 23 one of which is also shown in Figure 2.

The jacking device 21 as seen in Figure 2 comprises an externally screw threaded member 24 which engages in a screw threaded hole in the beam 14.

The upper end of the member 24 has a hexagon portion at 25 whereby it can be rotated in the beam and therefore adjusted relatively to the manhole cover or surrounding surface.

Within the member 24 is a stepped bore having a narrower portion 26. At one end of this adjacent to the hexagonal end of the member 24 there is an internal screw thread to engage a bolt 27. This bears on a piston 28 which is slidably engaged in the portion 26 of the bore. Upward and downward movement by screwing of the bolt 27 causes the piston 28 to move in this portion of the bore.

The wider portion 29 of the bore of the member 24 also contains a piston 30. This is loaded by a spring 31 towards the step in the bore and the spring 31 reacts against a closure ring 32 engaged in the end of the member 24. The piston 30 has a piston rod 33 which projects through the ring 32 beyond the end of the member 24.

The piston rod carries a shoe 34 which is connected to it by a circlip 35 or other fitting. The end of the piston rod as well as the socket in the shoe 34 into which it fits are part spherical so as to allow the shoe 34 to move relatively to the piston rod 33 to accommodate any unevenness in the surface on which the device may be resting.

To apply the load directly onto the ground and preferably also onto the frame 11 of the manhole cover there are provided loose blocks 36. In the example shown these are rectangular and in both Figures such blocks are shown resting on the ground 12 and also overlapping the manhole cover frame 11 at the point at which this is substantially flush with the surrounding surface.

The zone in the narrower portion 26 of the member 24 between the two pistons 28 and 30 is filled with fluid such as oil. As can be seen from Figure 2 downward travel of the smaller piston 28 forces some of this oil into the wider portion 29 of the stepped bore of the member 24 thus displacing the piston 30 and therefore also the shoe 34 attached to its piston rod. The relative sizes of the pistons 28 and 30 however, ensure that for predetermined travel of the smaller piston 28 a substantially smaller displacement of the larger piston 30 takes place.

In use, the device is placed as shown in Figure 1 over a manhole cover 10 to be lifted. The three blocks 36 are placed appropriately near the edge of the cover but not, of course, overlapping such edge and preferably engaging with the frame so that there is no risk that the frame as well as the cover is lifted relatively to the ground.

Appropriate tools 17, 18 are next fitted into the holes or sockets in the manhole cover. Tension is taken up on the tools by tightening the nuts 19 and

The jacking devices 21, 22, 23 are screwed down by their hexagonal portions 25 and adjustment is made between the jacking devices and the tools 17, 18 until even pressure is applied through the tools to the manhole cover and through the jacks to the surrounding surface and frame.

The bolts 27 are now screwed downwardly thus displacing the pistons 28 and 30 in each device. It is usually desirable to move each bolt 27 in turn so as to maintain even force and in due course the manhole cover will be lifted. It has been found that a device of this kind will lift even the most stubborn manhole covers with a minimum of effort on behalf of the operator.

In order to ensure that the breakage of a tool 17 or 18 will not cause parts to fly in a dangerous manner safety devices 37, 38 are provided. These comprise upstanding brackets which are located in the respective slots 15, 16. Each bracket has a slot to engage around the tool 17, 18 and over the nut 19 or 20. Thus, in the event that a tool 17, 18 breaks the tool will be restrained against movement by engagement of the nut with its appropriate bracket. These can be slid out of the way for tightening and loosening. Tool breakage is possible in view of the very great force which can be applied through the jacking devices.

It is possible to use other forms of jacking device either hydraulic mechanical or otherwise. It is possible to provide an external source of power such as a hydraulic pump or other means for supplying fluid under pressure but the device as illustrated is particularly simple and has no external connections, but is nevertheless capable of applying very great force to lift stubborn manhole covers.

Two, three, four or more jacking devices can be used on a beam of any desired shape. However again the shape chosen in the example illustrated has the advantage of being stable since there are three points of contact even where the ground on which the device rests is not level.

The tools are interchangeable as may be required to fit different manhole covers.

#### 110 CLAIMS (filed on 3rd Dec 82)

1. A manhole cover lifting device comprising a beam, at least one tool adjustably attached to the beam and arranged to engage in a hole in a manhole cover to be lifted, and at least two jacking devices engaged directly with the beam, means associated with each jacking device for engaging a frame into which the cover to be lifted is fitted, or the ground around the cover, the jacking devices in use being used to apply a force tending to lift the beam, and therefore, through the tool, the cover, relatively to the frame or ground.

2. A device as claimed in claim 1 in which the tool or each tool to engage in a manhole cover has a portion for such manhole cover engagement to pass into a hole in the cover and a portion extending through an opening in the beam.

3. A device as claimed in claim 2 wherein the portion of the or each tool extending through the beam is screw threaded and has a nut to enable the

position of the tool in the beam to be adjusted lengthwise of the tool.

4. A device as claimed in claim 2 or claim 3 in which the opening for a tool in the beam is an elongated slot, enabling the tool to be positioned in the beam lengthwise of the slot.

5. A device as claimed in any one of the preceding claims in which the jacking devices are hydraulic jacks.

10 6. A device as claimed in claim 5 in which the jacking devices are each actuated by screw means which actuate piston means within the respective jacking device.

7. A device as claimed in claim 5 or claim 6 in which the jacking devices are two stage devices enabling two rates of elevation to be carried out.

8. A device as claimed in any one of the preceding claims in which the beam is generally T-shaped with a jacking device at each extremity.

20 9. A device as claimed in any one of the preceding claims in which the tools include respective safety clamps which are placed to resist sudden upward movement of a tool if breakage thereof occurs.

25 10. A manhole cover lifting device substantially as hereinbefore described with reference to and as shown in the accompanying drawings.